

Lecture Module - Data Acquisition

ME3023 - Measurements in Mechanical Systems

Mechanical Engineering

Tennessee Technological University

Topic 1 - Analog to Digital Conversion

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- DAQ and Computer Storage
- Types of Integers
- Integers vs. Floating Point Numbers
- Analog to Digital Conversion
- Activity: ADC Resolution Calculation

DAQ and Computer Storage

A data acquisition system is the portion of a measurement system that quantifies and stores data. - Theory and Design of Mechanical Measurements

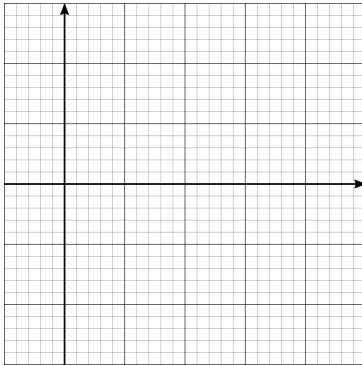


Image: T.Hill

Types of Integers

Binary	Decimal	Hexadecimal
0	0	0
1	1	1
10	2	2
11	3	3
100	4	4
	5	5
	6	6
	7	7
	8	8
	9	9
	10	A
	11	B

Binary	Decimal	Hexadecimal
	12	C
	13	D
	14	E
	15	F
	16	
	17	
	18	
	19	
	20	
	21	
	22	
	23	

some reference

Types of Integers

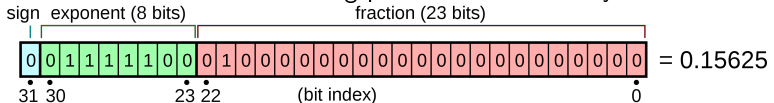
Binary	Decimal	Hex.
0	0	0
1	1	1
10	2	2
11	3	3
100	4	4

some reference

Binary	Decimal	Hex.
0	0	0
1	1	1
10	2	2
11	3	3
100	4	4

Integers vs. Floating Point Numbers

Standard definition of a floating point value in memory.



Reference: [wikipedia](https://en.cppreference.com/w/cpp/string/basic/basic_string_view)

Integers vs. Floating Point Numbers

Integer

Floating Point

Integers vs. Floating Point Numbers

Integer

Pros:

Cons:

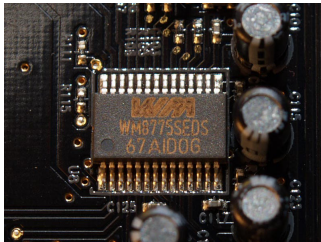
Floating Point

Pros:

Cons:

Analog to Digital Conversion

In electronics, an **analog-to-digital converter** (ADC, A/D, or A-to-D) is a system that converts an analog signal, such as a sound picked up by a microphone or light entering a digital camera, into a digital signal. An ADC may also provide an isolated measurement such as an electronic device that converts an analog input voltage or current to a digital number representing the magnitude of the voltage or current. Typically the digital output is a two's complement binary number that is proportional to the input, but there are other possibilities.

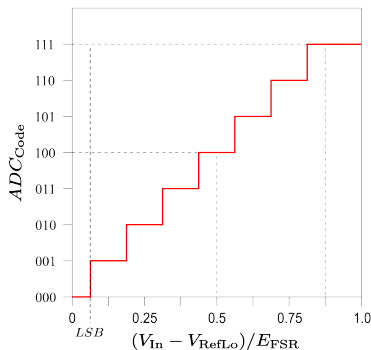


[wikipedia, image](#)



Analog to Digital Conversion

It is important to realize the potential for data loss resulting in a reduced quality measurement based on the parameters of the analog to digital conversion process. This issue can occur when designing systems around a low-level analog to digital converter as well as when using high-end DAQ equipment.



Activity: ADC Resolution Calculation

some reference